DOCUMENT RESUME

ED 249 973 IR 011 417

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TITLE Solutions Unlimited: Delphi Study on Policy Issues in the Introduction and Management of Computers in the Classroom. Research Report 90.
INSTITUTION Agency for Instructional Television, Bloomington, Ind.
PUB DATE Oct 83
NOTE 94p.; For other reports in this series, see IR 011 413-419.
AVAILABLE FROM Agency for Instructional Technology, Box A, Bloomington, IN 47402 ($2.50 per copy).
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; *Computer Software; *Delphi Technique; Educational Media; *Educational Policy; Educational Research; Elementary Secondary Education; Graphs; *Microcomputers; *Needs Assessment; Policy Formation; School Surveys; Statistics

ABSTRACT

The Agency for Instructional Television (AIT) has established a consortium of 42 state, provincial, and local educational agencies to develop computer/video materials in problem-solving, prepare inservice materials, and define and conduct policy studies. The purpose of this study, which focuses on the last task, was two-fold: (1) to identify issues related to the acquisition, management, and use of computers in education; and (2) to determine which of those issues were considered by the consortium to be the most important and appropriate for further study by AIT. The Delphi process was used as a means of involving as many consortium members as possible in an effort to reach group consensus on issues to be studied. Part 1 of this report explains the methods and procedures used to collect and analyze information on policy issues related to microcomputers in education. The results of the study are presented in Part 2, and the issues identified as having the highest or the lowest priority are detailed. Part 3 (the appendices) includes a copy of the survey and additional descriptive statistics. Based on 95 (44%) responses to a questionnaire mailed to 214 consortium representatives, it was found that issues felt to be of greatest priority are related to the roles and impacts of computers on the educational curriculum, the development and acquisition of appropriate and high-quality courseware, and the training of teachers. (THC)

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Research Report

NUMBER 90

SOLUTIONS UNLIMITED:

DELPHI STUDY ON POLICY ISSUES IN THE INTRODUCTION & MANAGEMENT OF COMPUTERS IN THE CLASSROOM

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Solutions Unlimited:

DELPHI STUDY ON POLICY ISSUES IN THE INTRODUCTION AND MANAGEMENT OF COMPUTERS IN THE CLASSROOM

Research Report 90

October 1983

Agency for Instructional Television
Box A
Bloomington, Indiana 47402

The Agency for Instructional Television is a nonprofit American-Canadian organization established in 1973 to strengthen education through television and other technologies. AIT develops joint program projects involving state and provincial agencies, and acquires and distributes a wide variety of television and related print materials available in audiovisual formats. AIT's predecessor organization, National Instructional Television, was founded in 1962. The AIT main offices are in Bloomington, Indiana.

This report was prepared by Ms. Deborah White and Ms. Leah Rampy.

IR011417

The Agency for Instructional Television (AIT) has established a consortium of 42 state, provincial, and local educational agencies to develop computer/video materials in problem solving, prepare in-service materials, and define and conduct policy studies. This report focuses on the last task.

This project envolved from a series of regional meetings in the fall of 1981, at which representatives from almost all states and provinces discussed their emerging needs and concerns for computers in the schools. Based on many agencies' lack of firm policies and organizational plans for the acquisition and use of computers, a recommendation to examine and study policy issues related to computers in education was forwarded. This recommendation was approved by the AIT Board of Directors and became part of this comprehensive project to advance the use of computers in the schools.

Since AIT, given time and economic limitations, could not (and perhaps should not) provide assistance with every policy issue of interest to the consortium of state, provincial and local education agencies, it was necessary to determine which issues were of widespread concern to participating agencies. Before priorities could be determined, however, issues surrounding the acquisition and use of computers in education had to be identified since no comprehensive list was known to exist. Thus the purpose of this study was twofold: (1) to identify issues related to the acquisition, management, and use of computers in education; and (2) to determine which of those issues were considered by the consortium representatives to be most important and approprite for further study by AIT.

Part 1 of this report explains the methods and procedures used to collect and analyze information concerning policy issues related to microcomputers in education. The results of the study are presented in Part 2 and the issues identified as having the highest or the lowest priority are detailed. Part 3, the appendices, include a copy of the survey as well as additional descriptive statistics.

Part 1: Methods and Procedures

Definitions

Delphi. The Delphi process was selected for use in this study because it was deemed important to involve as many of the consortium members as possible in determining the issues to be studied, and because it was hoped that group concensus would be achieved. The Delphi technique is "a method to systematically solicit, collect, evaluate, and tabulate independent expert opinion without group discussion" (Tersine and Riggs, 1976, p. 51). The Delphi process involves collecting information from experts about a given concern and then reporting to the participants the results of the group process, with invitations to reconsider their views when they do not coincide with the group views. This "voting" process may continue until a specified level of concensus is reached (Cunningham, 1982; Tanner and Williams, 1981; Turoff, 1975). The Delphi technique eliminates direct confrontation and provides for individual response without group pressure. This process invites group concensus with an opportunity for dissenters to voice their opinions and insights. Additionally, it allows equal participation of geographically distant members, bypassing the expense of travel.

Generating the information or concerns to be evaluated by the Delphi technique may take an inductive or a deductive approach (Tanner and Williams, 1981). In the inductive approach, all participants are asked initially to respond to an open-ended question, (e.g. Over the next 10 years this company should work towards....). The responses are then grouped and participants are asked to set priorities for each objective according to some predetermined value scale. In the deductive approach, the concerns are generated prior to seeking concensus (Tanner and Williams, 1981). The deductive approach was used in this study in order to save time and to capitalize upon the expertise of individuals who had worked extensively with microcomputers in education.

Policy Issues. For the purposes of this study, policy issues were defined as public, complex, and consequential concerns about which decisions must be made. Decisions about policy issues lead to planning and action (Linstone & Turnoff, 1975).

Implementation

Issue Generation. The first step in implementing the deductive Delphi process was to have experts from within the consortium membership generate the items for the questionnaire. This is usually completed using open-ended questionnaires, but to save time and develop a core team, a two-day conference/workshop was convened February 21 & 22, 1983. Six experts from within the consortium were selected to attend; they represented different geographic locales and levels of involvement in education. Those participating were:

Jim Thiessen	Alberta Education
Fred Bockman	MicroIdeas, (Illinois)
John LeBaron	Massachusetts ETV
Albert Goldberg	Wayne County (Michigan) Intermediate School District
Richard Pollak	Minnesota Educational Computing Consortium
John Grate	Cincinnati (Ohio) Public Schools

The group's discussions were based on the assumptions that (1) technology will be important to society and to the schools; (2) computers have a useful function in the teaching/learning process; and (3) planning for the adoption of innovations is an important responsibility.

An initial discussion focused on broadening participants' perceptions and ideas. It involved individual reflection followed by discussion of five questions:

1. Where would we like education to be in five years?
2. Where do we expect education to be in five years?
3. Where is education now?

4. What kinds of things need to be considered to meet our five-year expectation/desires?

5. What part will computers play in education in the future? ...in closing the gap?

This discussion was followed by a modified brainstorm and goal-sort on "issues to help educational units establish policy relating to the acquisition and use of educational technology, especially microcomputers." Participants wrote concerns on index cards during a 20-minute "individual brainstorm." In order to encourage open and frank discussion of each concern, all of the cards were gathered into one group, shuffled and redistributed randomly. During lengthy and dynamic group reflection and discussion, each of the more than one-hundred concerns was read aloud, clarified, and discussed. Gradually the concerns were synthesized and categorized according to broad concepts. The group worked toward consensus in the synthesis process, but consensus was not enforced. Working in small groups, the participants drafted each of the categories into a questionnaire issue consisting of a focal question followed by clarifying statements. To facilitate sorting, the items were written on index cards. These were read to the whole group to check for clarity and to insure that they expressed the essence of the issue.

The final step was the identification of evaluative criteria on which each issue would be rated. Of the many criteria generated, the seven used on the Delphi questionnaire were determined to be the most important: problem size, importance to agency, breadth of impact, appropriatness for AIT to study, level of concern, time-line of concern, and overall priority (see Table 1).

Magnitude:	Large (small) problem
Centrality:	Important (unimportant) for my agency's function
Influence:	Impacts many (few)
Relevance:	Appropriate (not appropriate) for this project to study
Focus:	Of greatest concern at federal, state/provincial, regional, local level
Timing:	Of greatest concern within 1-3, 4-6, 7-10 years

Table 1: Evaluative Criteria

Round One. Immediately following the conference, the drafted issues were edited and revised by the researchers to the final list of twenty-one. The evaluative criteria were selected and the format of the questionnaire was determined. The questionnaire can be found in Appendix A.

A postcard was mailed notifying representative members of consortium agencies that the questionnaire would be forthcoming. Three days later, on March 3rd, the Round One questionnaires were mailed to 191 members of the consortium. Each member was encouraged to distribute copies of the questionnaire to other members of their institution if they so desired. On the due date, follow-up telephone calls were made to key members and locales from whom responses had not yet been received. The follow-up calls did increase returns slightly.

A total of 108 questionnaires (56%) were returned. Of these, 85 were from respondents on the original mailing list and 23 were from individuals who had been given copies of the

questionnaire by collegues. Ninety-four percent of the respondents represented 34 different states; 6% of the respondents represented 4 provinces. Statistical analyses of Round One included calculations of means and standard deviations or frequencies for each of the 21 items. Percentages were calculated for the overall high and low rankings.

Round Two. The purpose of Round Two was to encourage each respondent to move toward the group consensus in their second ranking. The questionnaire was the same as the first, but included the statistical analyses from Round One as part of each item. Respondents were asked to justify any of their responses which differed from the mean by (plus or minus) one standard deviation. A total of 214 questionnaires were mailed. This mailing was sent to all of those consortium representatives on the original Round One list (191) regardless of their previous participation, plus all the extra respondents who completed Round One (23).

A total of 95 questionnaires (44%) were returned. Of these, 62 participated in Round One and 33 had not previously responded. Ninety-two percent of the respondents represented 29 different states; 8% of the respondents represented 3 provinces. Appendix B provides a list of the states and provinces participating in each round. The same analyses used for Round One were applied to Round Two data.

Consortium Meeting. Analyses and interpretations of the results from Rounds One and Two were presented to representatives of the consortium on May 1, 1983 at their second consortium meeting. The formal presentation was focused upon increasing members' understanding of the results, and providing a structure within which they could view the data and make informed recommendations for the final decision.

The large-group presentation was followed by (three) concurrent small-group discussions. The purpose of the small-group discussions was to identify the key issues that members thought should be studied during the following year. Three persons from the group who had been involved in generating the issues led these discussions. Members became further

involved with the issues and had an opportunity to clarify the results and freely voice their opinions regarding the continued investigation of policy issues. Summaries of each small-group discussion and their recommendations were reported pubicly to the entire group. The final decision about which issues will be studied, will be made by the central AIT staff in consultation with the advisory group.

Part 2: Results

The findings from the Delphi study are presented in four sections. The first discusses the assessment of the validity of the priority rankings reinforcing the researchers' confidence in them. The second and third sections detail the spedific results of the highest and lowest ranked issues, respectively. The last section discusses other analyses which compared all issues.

Priority Rankings

Consistency of Findings. As previously indicated, respondents in both rounds were asked to identify the three issues which were of highest priority to their agency, and the three issues of lowest priority. Table 2 shows the percentage of respondents who indicated that a given issue should rank among the top three priorities and the percentage who ranked the same issues among the three lowest priorities.

Issue	3 HIGHEST Priority (percentage) Round 1	Round 2	3 LOWEST Priority (percentage) Round 1	Round 2
1. Courseware development	14	22	0	<1
2. Courseware evaluation	8	11	1	0
3. Teacher training	8	13	2	0
4. Funding priority	4	2	1	<1
5. Business & industry roles	0	0	5	6
6. Other constituents' roles	1	0	12	18
7. Curricular impact	22	27	0	<1
8. Literacy curricula	4	5	1	0
9. Student competencies	2	0	5	2
10. Teacher certification	4	<1	2	2
11. Impact on teachers	3	1	3	1
12. Equal access	4	2	6	3
13. Ethics	2	1	11	9
14. Research	8	7	4	2
15. Planning for use	5	5	4	0
16. Outside human resources	0	0	11	19
17. Cost containment	2	<1	8	7
18. Vendor strategies	1	0	13	22
19. Hardware standards	3	<1	3	2
20. Organizational plans	4	1	3	1
21. Agencies' roles	3	0	5	3

Table 2: Priority Ranking for Rounds One and Two

Table 2 shows that Issue 7 (Curricular Impact) was ranked as a top priority by the largest percentage of respondents in both rounds, 22 and 27 percent respectively. Issue 1 (Courseware Development) was ranked second, followed by Issue 3 (Teacher Training) and Issue 2 (Courseware Evaluation). Issue 14 (Research) was the fifth most often selected high-priority issue.

The two columns on the right side of Table 2 reveal the issues rated as least important. Issue 18 (Vendor Strategies), Issue 16 (Outside Human Resources), and Issue 6 (Other Constituents' Roles) are clearly not as important to the participating agencies. Other issues of little concern are Issue 13 (Ethics) and Issue 17 (Cost Containment). Further discussion of all the issues follows.

A given issue may be strongly endorsed by some respondents and equally strongly opposed by others. Figure 1 (the line graph) presents information about the percentage of respondents who ranked each issue as a high and low priority during Round Two. The solid line indicates the percentage of respondents who indicated that an item was among the top three priorities; the broken line indicates the percentage of respondents who indicated that an item was among the three lowest priorities. Thus it is possible to also examine the magnitude of difference between the "high" and "low" issues. For example, the magnitude of difference on Issue 7 (Curricular Impact) is very large, suggesting a relative lack of strong disagreement on its importance (ie., agreement). The magnitide of difference on Issue 14 (Research) is much smaller, indicating less agreement on the importance of that issue.

Consensus Narrowing. Close examination of the evaluative criteria for each issue revealed that respondents in Round Two did move toward greater consensus. Figure 2 illustrates this consensus narrowing for Issue 1 (Courseware Development). Responses in Round Two, represented by the solid line, are clustered around the mean; few responses lie outside of (plus or minus) one standard deviation. Such a narrowing of responses is a characteristic and goal of the Delphi technique and consequently was expected, and considered a desirable outcome.

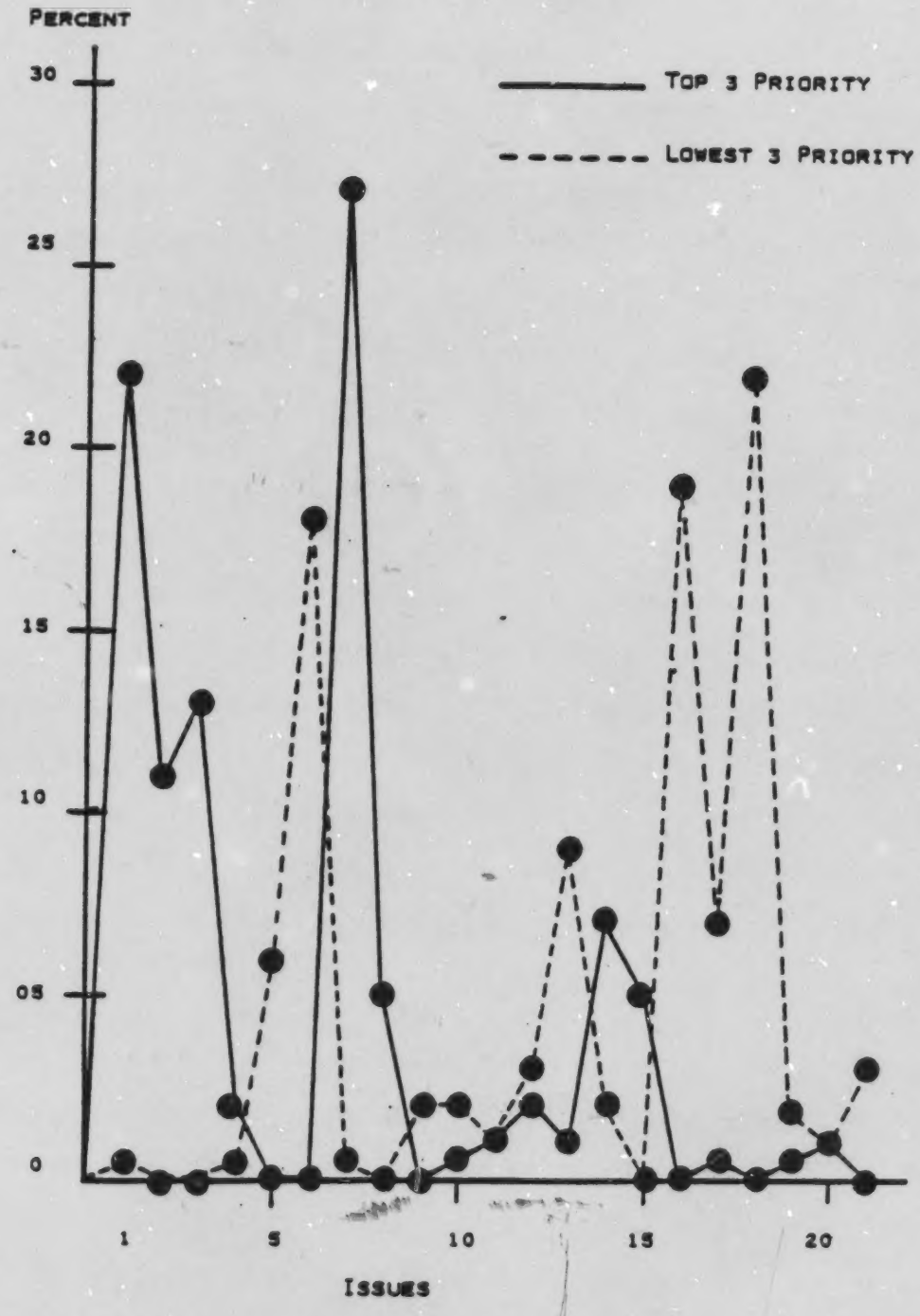

Figure 1: Priority Ranking for Rounds One and Two

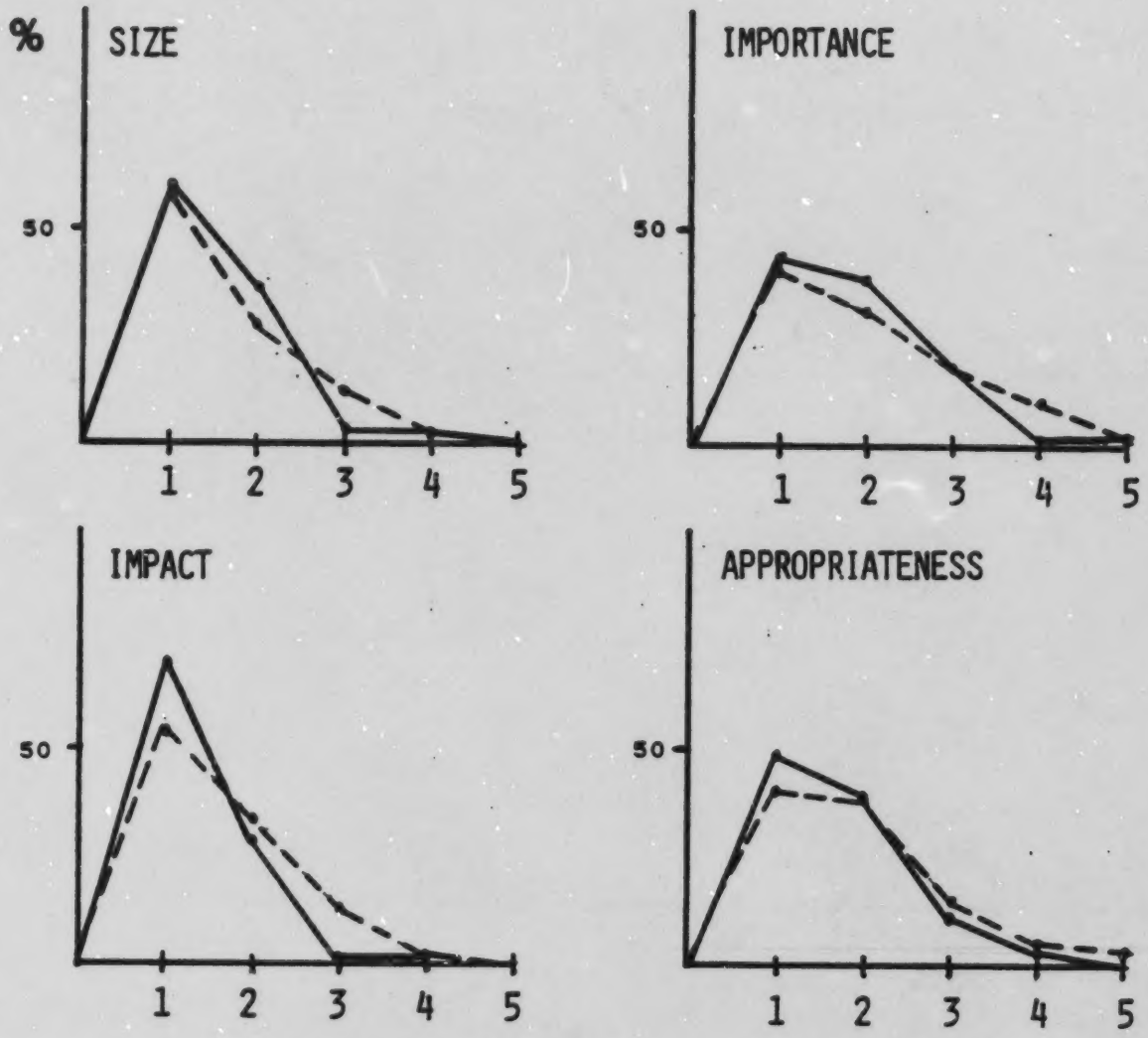

Figure 2: Issue 1 - Ratings for Rounds One and Two

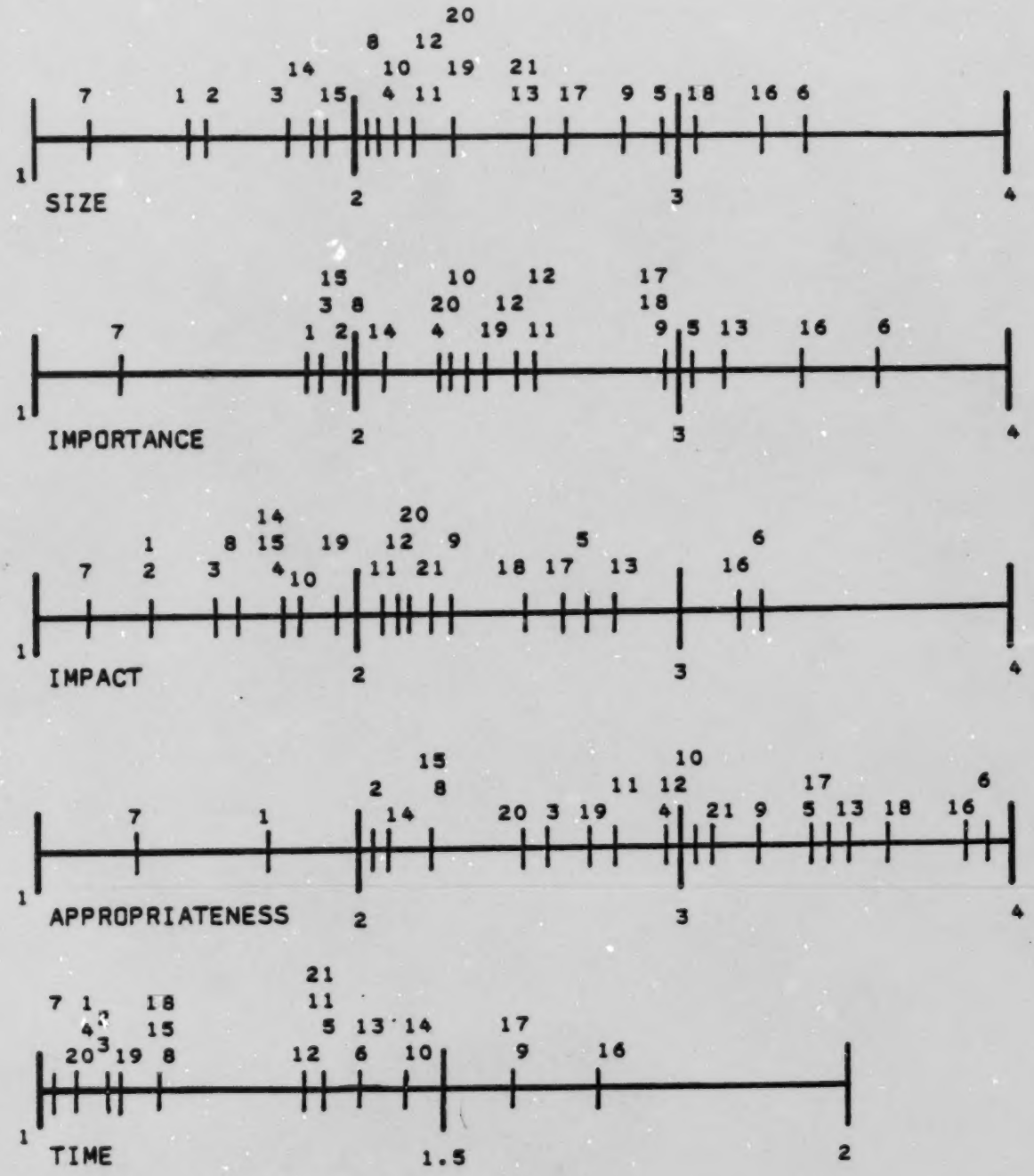

Figure 3: Round 2 - Mean Scores

Priorities Maintained. In focusing on individuals rankings of the issues on each of the evaluative criteria, it is clear that the overall high rankings for Issues 1, 2, 3, 7, and 14 are maintained. Figure 3 (previous page) shows the mean-scores for each issue on value criteria 1-4 and 6. The five highly ranked issues are clearly separate from the five ranked lowest (Issues 6, 13, 16, 17, 18) on each criteria except time. Additionally, the top five issues are fairly consistent in their sequence (7 > 1 > 2,3 > 14).

Five Highest-Priority Issues

In this section, each of the top five issues will be detailed. Both quantitative and qualitative findings will be discussed. The next section will note the five issues of lowest priority. The means and standard deviations for the rating of each issue in Round Two are located in Appendix C.

> Issue 7: Curricular Impact. What roles will computers have in the school curriculum?
>
> This issue includes the determination of goals for microcomputer usage and the extent of their integration. Computer literacy, CAI, programming and access to data bases are common applications. What are the best uses for computers in classroom curriculum? At what grade level should the computer be introduced? In which content areas can it meet curricular goals and student needs most effectively.

This issue is clearly rated as the highest on each of the six criteria. It is statistically different from any of the other issues ($p <= .004$).

Several respondents stressed the importance of this item, calling it the "key question," "the most important issue," and "without question, the heart of the matter." However, two people were not sure that this item was important for their agency. One felt that this issue was best determined at the local level; the other wrote that this issue would only be of interest if the outcome favored the agency's participation in curriculum implementation.

Evaluative Criteria

1.	Large problem	1 2	3	4	5	Small Problem
2.	Important for my agency's function	1 2	3	4	5	Not important for my agency's function
3.	Impacts many	1 2	3	4	5	Impacts few
4.	Appropriate for this project to study	1 2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - 20 9 federal level
   - 73 37 state/provincial level
   - 43 32 regional level
   - 95 95 local level
   - 5 1 other level: please specify small business

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

Table 3: Curricular Impact*

Several respondents made suggestions about how to solve the "problem." For instance, one person proposed that teachers, administrators, government, business, and parents from the local area be included in the development of curriculum implementation plans. Only one person strongly opposed the study of this issue; s/he wrote, "Wrong question. You will end up with a formula — rather than, in any given curriculum situation, what can a computer contribute to learning?"

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* The mean rating and range of variance are shown for each issue on the following pages. For evaluative criteria #1 to 4 and 6, the solid lines indicate Round-One results; the dashed lines show Round-Two results. For criteria #5, the percentage of respondents indicating the issue as a concern at that level is given. Round-One results are on the left; Round-Two data are on the response line.

Issue 1: Courseware Development. How can educational agencies promote the development of high-quality, low-cost, effective courseware for use with computers?

Productive use of computers to support instruction is dependent upon the quality, cost and effectiveness of courseware. What organizations are capable of developing high quality courseware? Under what conditions should districts and teachers undertake courseware development activities? How should schools make their courseware needs known? What incentives are there for quality in courseware? How can districts locate and acquire good courseware? What are the benefits of courseware licensing agreements? Will conflicts arise with home and school use of similar instructional courseware?

Evaluative Criteria

1. Large problem — 1 2 3 4 5 — Small Problem
2. Important for my agency's function — 1 2 3 4 5 — Not appropriate for this project to study
3. Impacts many — 1 2 3 4 5 — Impacts few
4. Appropriate for this project to study — 1 2 3 4 5 — Not appropriate for this project to study
5. Of greatest concern at: (check as many as necessary)
   - 24 9 federal level
   - 77 31 state/provincial level
   - 43 41 regional level
   - 72 75 local level
   - 4 4 other level: please specify unspecified
6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

Table 4: Courseware Development

This issue is rated second on every criterion. Statistically, it is rated significantly lower than Issue 7 ($p <= .004$), except for its time frame.

A concern about the time frame was voiced by several of the respondents who argued that, while this issue was an ongoing need, it was of critical concern now. The importance of

state support was raised by one respondent who wrote:

> While there is concern at the local level, funding and personnel need to come from a wider pool, such as the state. In addition, this eliminates the need for each teacher to reinvent the wheel. We wouldn't think of asking teachers to produce their own filmstrips before expecting them to make use of the appropriate hardware.

One suggestion was made that educators should determine how to promote high quality software through consortium-type efforts.

Not everyone supported addressing this issue. One argument raised was that AIT might not be able to be objective in responding to this issue. A second argument against this issue was that since this project has insufficient funds to "do everything," efforts should "concentrate on services which have higher need and [are] more likely to be accepted by the intended recipients."

> Issue 2: Courseware Evaluation. How and by whom should computer courseware be evaluated? How can the results be disseminated?
>
> The proliferation of computer courseware is both a blessing and a dilemma. It provides many alternatives to the user, but also makes the process of evaluation and selection greater than any one individual can manage. What standrds of quality should be established and maintained? What agencies should be involved in the evaluation of courseware? What criteria are most useful for evaluating courseware? Should there be central courseware evaluation units and clearinghouses?

The ratings for this issue are very close to those for Issue 1, especially when considering the appropriateness (criteria 4) of these issues. This similarity is not surprising; conceptually the two issues are highly related.

Evaluative Criteria

1. Large problem — 1 — 2 — 3 — 4 — 5 — Small Problem

2. Important for my agency's function — 1 — 2 — 3 — 4 — 5 — Not important for my agency's function

3. Impacts many — 1 — 2 — 3 — 4 — 5 — Impacts few

4. Appropriate for this project to study — 1 — 2 — 3 — 4 — 5 — Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

21	8	federal level
73	29	state/provincial level
49	41	regional level
78	65	local level
4	1	other level: please specify higher education

6. Of greatest concern within: (Please circle one)

(1-3 years) ● (4-6 years) ● (7-10 years) ●

Table 5: Courseware Evaluation

In terms of the time frame, some respondents wrote that this issue was both an immediate and ongoing need; others commented that it required long range development. Little agreement was evidenced concerning the level at which this issue was most important. Two written comments indicated that this issue was important at the local level, but that state support was needed. Others felt that the criteria should be developed at the regional level but implemented at the local level, that centralization is good but not enough. Several respondents seemed to favor evaluation exclusively at the local level, however they noted that:

> The users (teachers and students, if possible) that are going to use the courseware are the best evaluators.
>
> Local instructional needs tend to vary and so will their software requirements. One district might find a software package perfect, while another finds the same package unusable.

Evaluation of courseware is indeed an ongoing problem. The proliferation of national and statewide evaluation systems can result in duplication of effort. The most effective evaluation takes place at the local level. The educational market will soon develop a workable system as has developed for other instructional software, rendering bureaucratic structures created for such ends obsolete.

Issue 3: Teacher Training. What computer training should be required for teachers and administrators? How should the training differ?

Different training is often needed for the various administrative, management, and teaching-learning functions in educational organizations. Training may vary in length, scope, content, technical sophistication and the extent of hands-on experience.

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

12	3	federal level
71	92	state/provincial level
47	32	regional level
81	96	local level
3	3	other level: please specify unspecified; higher education

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 6: Teacher Training

The ratings for this issue are quite close to those of Issues 1 and 2, except that this issue was rated as less appropriate for study by AIT. Indeed, the respondents' perceptions of the

appropriateness of the issue for study may be an important factor when considering AIT's emphasis on this issue.

Arguments for the importance of Issue 3 stressed that teachers and administrators need background and experience for intelligent planning and decision making. One respondent wrote, however, that this issue may not have widespread impact with the proliferation of home comptuers; others may not agree with his/her comment.

Issue 14: Research. What kinds of research should be done concerning educational uses of computers?

There are instructional effects of using computers in schools. Included in this issue would be both positive and negative physical, cognitive, affective and sociological impacts of computer use. Which students benefit most from the instructional use of computers? Will research findings affect computer adoption and use?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

68	56	federal level
76	90	state/provincial level
36	22	regional level
63	60	local level
11	4	other level: please specify higher education; consortia

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 7: Research

This issue is rated lowest of the top five issues, on each criteria except appropriateness. Additionally, it is interesting to note that it will be of greater concern in the future, within approximately 3 to 5 years.

Written responses to this issue were diverse. In favor of further study, some respondents wrote that research should be one of the major concerns of this project, that it is important for state agencies to interpret research results, and that research should be translated into practice. Others wrote that the present question was too large or that it should be conducted by others outside the consortium. Concern was also voiced that the research implied by this issue would be at least as expensive as this entire project; because of AIT's record of providing excellent instructional help, one respondent thought the consortium should focus on instructional materials rather than on research.

Five Lowest-Priority Issues

> Issue 17: Cost Containment. How can the introduction of computers assist in cost-containment in the educational enterprise?
>
> The cost of doing business in education continues to escalate. Is it possible to place some restraint on these increases through the use of technology, yet without tampering with the essential roles and responsibilities of the teacher? Is cost-containment more appropriately applied to the general curriculum, auxiliary programs, instructional services, or management services?

It is obvious that this issue was not considered to be a substantial concern in this project. It was felt to be of most concern at the local level. Participants did not feel it appropriate for AIT to study, or as an important aspect of thiir agency, but rated it as becoming more important in the future.

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

34	15	federal level
74	64	state/provincial level
21	14	regional level
82	90	local level
1	0	other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 8: Cost Containment

Those who responded in writing to this issue disagreed with the underlying premise that computers can assist in cost-containment. One respondent wrote that cost-containment as a primary reason for introducing computers was "both impolitic and impractical." Another wrote that "good" programs, available to all, may indeed cost more.

Issue 13: Ethics. Is the unauthorized duplication of educational courseware detrimental to the production and distribution of courseware?

Developers and distributors have to charge higher per unit prices for their products because they need a reasonable return on their investment. In addition, there are ethical and moral implications of educators copying computer programs without permission.

Evaluative Criteria

1. Large problem — 1 2 3 4 5 — Small Problem

2. Important for my agency's function — 1 2 3 4 5 — Not important for my agency's function

3. Impacts many — 1 2 3 4 5 — Impacts few

4. Appropriate for this project to study — 1 2 3 4 5 — Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - 44 72% federal level
   - 57 93% state/provincial level
   - 30 49% regional level
   - 41 67% local level
   - 8 13% other level: please specify software industry

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

Table 9: Ethics

Again, participants were not as concerned by this issue and felt it should be handled at the federal level. It was not considered to be a particularly large problem for the participants, although the variance was quite large on ratings for each of the criteria, suggesting a great diversity of opinion on this issue.

Two of the seven individuals who responded to this issue in writing sided against this issue as a priority, arguing that it was a futile effort and would probably be handled at the federal level. Those in favor of studying this issue argued that illegal duplication and marketing adds considerably to the cost of courseware and will influence the quality. One respondent wrote, "Because I anticipate telecommunication facilities becoming distributors via downloading, disc, etc., it is critical for us to think about this issue now."

Issue 10: Vendor Strategies. What kinds of strategies are most effective for educators in dealing with vendors?

At times, the collective strategy of groups of users may be more effective than individual efforts. In developing effective strategies, much can be gained from the experience of other users. Such experience might reveal useful standard contracts regarding purchase, maintenance, warranty, courseware transportability, and on-site training. Vendors might be persuaded to enter into state-wide annual bid agreements. Educators might consider the establishment of regional or statewide collectives as they set strategy for purchase.

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

/0 4 federal level
82 78 state/provincial level
40 31 regional level
77 61 local level
3 4 other level: please specify unspecified; consortia

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 10: Vendor Strategies

Strategies for dealing with vendors was considered to be of great concern at both the local and state/provincial levels, although it was not felt to be very important by the participants. They did not consider it appropriate for AIT to study, but did recognize that it was a current issue needing attention in the next few years.

Written responses to this issue varied. One respondent wrote that the responsibility for purchase lay with the state and local levels; a second, that the responsibility belongs to

state and district levels; a third wrote simply, "Caveat emptor." One agency encouraged people to form group buying arrangements. A respondent from Illinois noted the establishment of regional consortia with bids pursued on a state level with communication among the consortia.

Issue 16: Outside Human Resources. How should schools identify and use outside human resources to further the use of computer technology?

A wide variety of human resources exists both inside and outside schools which can be assessed and used. These include retrained teachers, advanced placement students, retired volunteers, college and university personnel, personnel from other systems, private sector resources, and community agencies. Educational institutions have been somewhat reluctant to identify and utilize these resources.

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

9 / 1	federal level
41 / 33	state/provincial level
29 / 12	regional level
87 / 95	local level
4 / 1	other level: please specify unspecified

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 11: Outside Human Resources

Respondents felt this issue was of concern at the local level and was not appropriate for AIT to study. It is an issue, however, that will be most important throughout the next five years.

One respondent was in favor of further study of this issue because of decreasing funds at state and local levels. A second rationale offered for supporting study of this issue was as follows:

> We need all the opportunities we can obtain to provide good experiences for students. This is especially true for students with the interests and abilities to progress greatly in this field. The schools cannot provide the experiences with sophisticated equipment manned by expert staff, unless other agencies open their doors to us. We need more volunteers in our schools to help all students.

Issue 6: Other Constituents. What other groups are interested in the use of computers in the schools? What is their influence?

Groups such as PTA/PTO's, community and professional organizations have already become involved with computers in schools. What is the range and focus of outside concern? What influence are these groups having? In what activities should these groups become involved?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

3	3	federal level
24	10	state/provincial level
16	11	regional level
96	100	local level
1	0	other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 12: Other Constituents

Again respondents felt this issue was of most concern at the local level and over the next five years. This issue is considered to be much smaller and less important than others previously discussed. Most respondents did not feel AIT should study this issue any further.

Several respondents wrote that this issue was irrelevant to the study and that it might "dilute" other, more important activities. However, one respondent noted that if federal funds and monies from business and industry are not forthcoming then these community groups may be the "next best resource."

"Middle" Eleven Issues

The remaining issues were not considered to be as critical as the top five discussed previously, but more important than the lowest five. They are sequenced according the their perceived level of importance, from more important to less important; the first few are still of greater importance to members. Each questionnaire item is followed by a chart of its quantitative summary data and additional comments from respondents.

Issue 13: Planning for Use. How can educational agencies encourage realistic and reasonable plans and expectations related to the use of computers?

The current "technology hype" created by media, commercial interests, and education itself, is developing expectations for unrealistic outcomes. Parents, community groups and some educators may be creating pressures that prevent reasoned planning, implementing and evaluating computer use. Should attention be focused on a more broadscale integration of technology in school curricula, rather than on only one medium?

Participants' comments confirmed the quantitative findings that this issue is a major concern that is often overlooked. They noted that it is tied to other issues as well. All of the comments supported what one person explained as the need "to be responsible 'advancers'." Another person felt that "helping set realistic expectations for what's possible and not possible is most important." A few recognized the tendency for society to impatiently rush into new innovations. One respondant stated "One of the advantages of the media hype problem is

that it goes away quickly. The mass media needs drama...educators need to talk sensibly and stay calm." The need for research to temper this issue was also forwarded: "Reliable, credible research will help us with this. Facts and information are the antidote for 'hype'.

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

38 21 federal level
88 49 state/provincial level
38 25 regional level
76 84 local level
5 0 other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 13: Planning for Use

Issue 8: Literacy Curricula. Is there a specific need for "computer literacy" curricula within the broader scope of K-12 curricular concerns?

As schools have focused increasing interest on the adoption of computer technology for teaching and learning, there has been increasing pressure to teach "computer literacy" to students. The point has been made tha contemporary society generally knows how to use automobiles but is not — nor does it need to be — "car literate." What does "computer literacy" mean? Is it necessary for students to become "computer literate" rather than competent users of computers? What computers? What computer competencies are important at each grade level?

Evaluative Criteria

1.	Large problem	1 2 3	4	5	Small Problem
2.	Important for my agency's function	1 2 3	4	5	Not important for my agency's function
3.	Impacts many	1 2 3	4	5	Impacts few
4.	Appropriate for this project to study	1 2 3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

18	7	federal level
85	82	state/provincial level
34	19	regional level
89	92	local level
4	0	other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 14: Literacy Curriculum

Many of those commenting still didn't feel they clearly understood what 'computer literacy' is and felt their answers would depend on the definition of the concept. One respondant stated, "I believe that 'computer literacy' is a phrase with all the meaning of 'back to basics'." Another group of comments quiered the need for computer literacy; many echoed the arguement about how our society is generally 'car and telephone illiterate'. Some noted that the need for 'literacy' will vary from student to student. One comment minimized the need for a stringent curriculum: "Literacy probably does have to be addressed, but it shouldn't be too tough a problem assuming kids start using computers in a variety of contexts."

Lastly, there were a group of respondants who supported the need for computer literacy: "it is accepted without question that this is a need"; "right on!; the computer is a tool and a solution"; and "if it means learning how to live with computers so that computers

can enhance the quality of life then it is very important!" The two issues of equal access (Issue 12) and integration into the curriculum (Issue 7) were referenced in comments related to computer literacy:

> De facto, school children will become computer literate unless there is unequal access to computer technology as a function of SES— this possibility must be avoided.
>
> Important, yes, but computer literacy should not be viewed as a separate subject, rather integrated into existing subjects.

Issue 4: Funding Priority. How high a priority should be placed on funding to support computers in the schools?

Which funding agencies should bear the responsibility for hardware and courseware acquisition and distribution? Courseware development? Inservice and preservice? Administrative applications? Testing? What is the role of the federal government in funding?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

52	41	federal level
82	85	state/provincial level
31	16	regional level
75	89	local level
4	4	other level: please specify small business; consortia; professional organization

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 15: Funding Priority

Comments regarding funding included the feeling that there is a lack of proper funding ("by public demand, education is grossly underfunded) and that funding is a local matter. On this second point, one respondant exclaimed,

> We're talking big bucks — if there is not a high priority placed on funding, I'm afraid many students will become the 'have nots' of society. The Dark Ages mixed with High Tech! If our school systems are not fiscally independent, then officials in local governments need to sit on the policy-making committees.

One respondant noted that funding is crucial to his/her agency's job:

> Funding determines the level of activity and services we are able to offer. Outside funding is an issue for some more than others. The impact of the priority varies with the size of 'the pie'.

Another suggested that business and industry should support schools (Issue 5) and another that information was necessary for the wise allocation of limited local resources.

> Issue 20: Organizational Plans. What organizational plans have been successful in introducing and managing the use of computers in schools?
>
> Each educational agency has an organizational structure. Are these structures conducive to the introducing of computers into schools? Which organizational strategies have been shown to be most successful? What management techniques are successful for utilizing computers in classrooms?

Most respondants who commented felt that developing an implementation strategy is a high priority, a major problem. One commented that it "becomes important when a district really makes a commitment to computers in schools." Two suggestions for developing such strategies were made. One person saw a "definite demand for district plan samples." Another suggested that "this is another area where people can learn from good managerial/organizational models. But learning and making organizational changes are two different things."

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

19 4	federal level
68 67	state/provincial level
37 20	regional level
87 93	local level
1 0	other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 16: Organizational Plans

Issue 10: Teacher Certification. What do teachers need to know about the use of computers in education? Should certification requirements be established?

The growth of computer use in schools raises issues about the capacity of teachers to cope with and use computers wisely. If "computer literacy" standards were to be established for students, it follows that similar standards should apply to at least some teachers. Consequently, two categories of questions arise:

1. Teacher requirements: Should "computer literacy" be a certification requirement? Should such a requirement be applied retroactively to presently-certified teachers? If certification requirements were established, should different standards apply to different categories of teachers?

2. Training and support: If a "computer literacy" certification were established, what kind of pre- and in-service training and support programs would be needed in order to reasonably meet the requirement?

Evaluative Criteria

1.	Large problem	1 2 3	4	5	Small Problem
2.	Important for my agency's function	1 2 3	4	5	Not important for my agency's function
3.	Impacts many	1 2 3	4	5	Impacts few
4.	Appropriate for this project to study	1 2 3 4		5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - 16 5 federal level
   - 91 96 state/provincial level
   - 25 17 regional level
   - 61 73 local level
   - 3 1 other level: please specify higher education

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-18 years)

Table 17: Teacher Certification

Some respondants echoed their concern that the concept 'computer literacy' had not yet been clearly defined. Others recognized that "teachers need to be well prepared in many areas including, but not limited to, computers." Two other respondants suggested preservice training in the use of computers, but one added that this "could develop into a real toughie. What about the 'older,' non-computer literate teachers?" None of the respondants tried to identify what it is teachers need to know about computers to use them in their classrooms.

Issue 19: Hardware Standards. What standards (guidelines) should be established for hardware acquisition?

With the proliferation of mutually-incompatible low-cost computers, a potential user is faced with many difficult choices. Most claim that the rapid advancement of technology depends upon the competition generated by non-standardized machines. Educators counter that such incompatibility severely limits the potential use of the computers they buy. Would educators

be aided by the establishment of standards (guidelines) for hardware acquisition? If so, what should the criteria be? Should hardware standards (guidelines) be related to courseware availability? To machine capacity? To price? How restrictive should these standards (guidelines) be?

Evaluative Criteria

1. Large problem — 1 2 3 4 5 — Small Problem
2. Important for my agency's function — 1 2 3 4 5 — Not important for my agency's function
3. Impacts many — 1 2 3 4 5 — Impacts few
4. Appropriate for this project to study — 1 2 3 4 5 — Not appropriate for this project to study
5. Of greatest concern at: (check as many as necessary)
   - 28 46 federal level
   - 73 80 state/provincial level
   - 47 24 regional level
   - 81 85 local level
   - 2 1 other level: please specify community
6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

Table 18: Hardware Standards

There were a variety of viewpoints and suggestions made by respondants. Quite a few thought competition was valuable and that compatibility across machines would occur eventually. One person suggested, "We must have regional duplication centers able to help on the problem, but this must be part of and acceptable vendor marketing plan." Another suggested supporting developments of interchangeable languages across computers. A number of respondants indicated the need for hardware factsheets with recommendations for decision-making committees.

A second group of respondants supported non-standardization. One commented:

> I have strong feelings on this: yes, it would be cheaper and more convenient for schools if there were standardization, but a student would not benefit. If a student is to be prepared for life, then s/he should know process, not machine....To facilitate this, kids need to learn on a number of machine types.

This group noted that hardware selection should be a district-level decision based on the roles computers were to have in the curriculum, and the particular learning objectives upon which they would impact.

> Issue 21: Agencies' Roles. What agencies should set standards (guidelines) for the acquisition, development and dissemination of courseware and hardware? Should they also set standards for teacher certification?
>
> What is the appropriate role for the federal agencies, state/provincial educational and telecommunications agencies, regional, and local agencies in the acquisition and development of computer technology? Should some aspects of the responsibility rest entirely with intermediate units or districts? What roles and responsibilities should commercial and/or independent non-commercial organizations (e.g., AIT, PTV stations) play in setting standards and distributing hardware and software? Are specific types of leadership needed at different levels? Who should enforce the standards?

Evaluative Criteria

1.	Large problem	1 2 3 4 5	Small Problem
2.	Important for my agency's function	1 2 3 4 5	Not important for my agency's function
3.	Impacts many	1 2 3 4 5	Impacts few
4.	Appropriate for this project to study	1 2 3 4 5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

37	16	federal level
89	93	state/provincial level
33	21	regional level
46	73	local level
3	3	other level: please specify higher education; professional organization

6. Of greatest concern within: (Please circle one)

(1-3 years) ● (4-6 years) ● (7-10 years) ●

Table 19: Agencies' Roles

Of the few comments provided on this issue, most supported local control of the innovation. One person commented that "identification of the agency is not as important as the setting of standards." Another suggested that the "national trend for policy making is local!!"

Issue 12: Equal Access. How should resources be allocated to insure equal educational access to computers?

This issue goes beyond the disparity among rich and poor districts and schools. It includes limiting the availability of computers to only the gifted or remedial students. Can other organizations (e.g., public libraries) be helpful in solving the equity problem?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

40	38	federal level
79	84	state/provincial level
33	32	regional level
74	79	local level
2	1	other level: please specify consortia

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-18 years)

Table 20: Equal Access

Comments on this issue ranged from one end of a continuum to the other. Most optomistically, some commented that "provincial funding ensures equality." Others felt the problem "will become smaller problem as hardware becomes cheaper; rectified by time and cost."

A second group sought to more clearly explain the problem: "[It] includes concerns regarding applications and sexism and racism and age factors. This is a role for government—to protect those in need." "The problem has already arisen that more boys are computing than girls. That has an impact on their earning ability as adults." One person suggested that "this is a community problem....study centers open evenings, industries housing a computer for students in the neighborhood to use, software libraries, etc." At the other end of the continuum, one respondent commented, "Are we really going to address disparity in general? This is a fact of a pluristic society—we should learn to live with it—it is unaddressable!"

Issue 11: Impact on Teachers. How does the introduction of computers into the classroom affect teachers and administrators personally and professionally?

What is the profile of teachers and administrators who use computers in the classroom or office? How will the role of teachers change with increased use of computers? How can teachers be motivated to use computers in their classrooms? Will the new technologies create stress for teachers, students and others? If so, what can be done to reduce such stress?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

23	9	federal level
48	51	state/provincial level
23	23	regional level
84	96	local level
6	1	other level: please specify higher education

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-12 years)

Table 21: Impact on Teachers

Three themes were evident in the comments made about this issue. First teachers must feel a need for the computer before they will be motivated to learn about it. One comment was quite pessimistic however, "[It is] hard to think of any project—designed to motivate teachers to do something to which they are resistent—which has been successful." A second theme supported the need for training.

> Training is a must. Hopefully, local level will take the initiative, if not, state will have to step in for the mop-up. Increase person's knowledge of computers, teach how to operate, shows uses of same. Understanding lessens fear and threat.

The third theme purports accessibility and availability as two factors affecting the use of computers by teachers: "The availability of useful software and accessibility to computers will determine how teachers will use both."

> Issue 9: Student Competencies. Should all students meet minimum computer competency requirements?
>
> The question of standards in any curricular area is complex. It is no less so with "computer literacy." Once we know what the term means, we might ask if grade-level or graduation standards should be imposed. If so, should it be done at a national, state, local, or some other level? Should all local districts be required to comply with standards set at higher levels? Should "computer literacy" be treated as another basic skill? How and by whom should "computer literacy" performance be tested? In seeking definitions of the terms and answers to the question of standards, models of research and promising practices will be needed for guidance.

Most of the participants who commented on this issue did not feel competency requirements were necessary. Comments included: "Standards for using a telephone? a pencil? then why a computer standard in subjects where computers are applied?" "Computer competency will be dealt with in the same way as handwriting competency." "No, although idealistic, there are other curriculum needs that are better for students." One respondant explained that "This issue gets in the way of agencies such as ours investigating the role and impact on micros in education. The whole business of setting standards should be avoided." One respondant inquired as to the rights of local schools, "Should all local districts be required to comply with standards set at higher levels? Should 'computer literacy' be treated as another basic skill?"

One supported the idea of standards: "literacy in terms of how to operate one? In terms of what computers mean in how we learn, function, and how they affect society? Absolutely!"

Evaluative Criteria

1. Large problem	1 2 3 4 5		Small Problem
2. Important for my agency's function	1 2 3 4 5		Not important for my agency's function
3. Impacts many	1 2 3 4 5		Impacts few
4. Appropriate for this project to study	1 2 3 4 5		Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - 4 federal level
   - 73 state/provincial level
   - 19 regional level
   - 91 local level
   - 0 other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-18 years)

Table 22: Student Competencies

Issue 5: Business and Industry Roles. What roles should business and industry play in the adoption and use of computer technology in schools?

This issue addresses the types and extent of support the private sector should be encouraged to offer. Support from business and industry can come in the forms of fundings, hardware, volunteers and personal exchanges, internships, etc. What are the limits of business and industry's influence on what is taught in schools?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

35 10 federal level
59 43 state/provincial level
37 21 regional level
71 91 local level
10 4 other level: please specify small business

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

Table 23: Business and Industry Roles

Two comments indicated views that assistance from business and industry is not really needed: "Schools and educational institutions are taking up the initiative and responsibility for computer and related technologies." "The more business helps in the schools, the less they will have to fund there own training programs." One respondant supported the idea of a partnership: "I believe that business and industry should play a large role in education. There should be a real partnership between the schools and business." Others suggested that businesses could provide funding, information and political influence:

> The only role I see for industry is that they should be keeping schools apprised of societal and business trends so that kids learn the necessary things.
>
> Industry can help pay some of the early costs of getting computers into the schools. But looking for it to be a principal direct leader is a mistake. Since business already pays for education indirectly via taxes and its payrolls, it is probably likely to be a better political ally and a source of information than a source of new funds.

One person quiered: "Is AIT planning to be instrumental in pursuing cooperative efforts of the private sector?"

Overall Comparisons

Level of Concern. Figure 4 compares the percentage of persons indicating the issue of great importance at each of five levels: federal, state/provincial, regional, local, and other. The five highest ranked issues are of greatest concern at both the state/provincial and local levels. The five lowest ranked issues are of predominant concern at the local level. This difference points our that it may be important to consider who the final users will be. Will the states/provinces use the information to formulate state/provincial-level policy? Or, will they use the information to guide local education organizations in formulating their own policies? It is perceived that there is greatest concern at the federal level for Issue 14 (Research) and Issue 13 (Ethics). Other types of organizations that are perceived as important in considering to these issues are: higher education (Issues 2, 3, 14); small business (Issue 7); the software industry (Issue 13); consortia (Issues 14, 18).

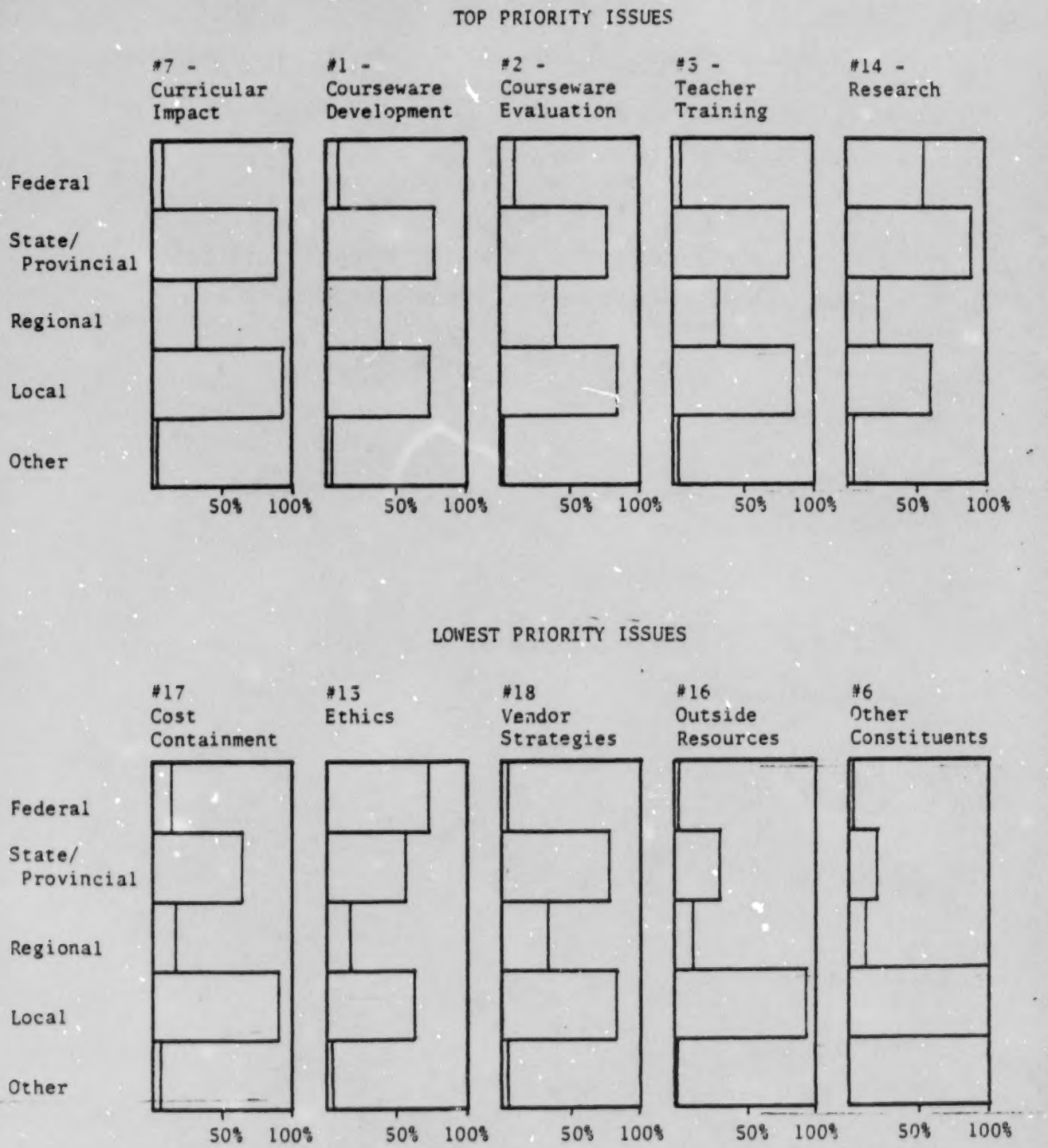

Figure 4: Percentage of Concern per Level

Factor Analysis. A factor analysis of the 21 issues was run in an attempt to determine any meaningful relationships between the issues. No reliable results emerged indicating that the number of issues could not be narrowed statistically. The failure of the procedure was most likely due to the multiple dimensions contained within each issue. Alternatively, the most appropriate evaluative criteria may not have been included in the questionnaire. Some categories into which the 21 issues (listed on right) can be sorted conceptually are:

Curricular	7, 8, 9, 12, 14, 15, 20
Courseware	1, 2, 13
Teachers	3, 10, 11
Roles of External Agents	5, 6, 16, 21
Acquisition & Funding	4, 17, 18, 19

These categories may be helpful to decision makers in focusing on related issues of greatest concern to their specific organization.

Summary

Clearly, across all the twenty-one issue raised in this Delphi study, the quantitative results, measured on the six criteria in the questionnaire, are supported by the qualitative comments of the respondants. Issues felt to be of highest priority are related to the roles and impacts of computers on the educational curriculum, the development and acquisition of appropriate and high-quality courseware, and the training of teachers.

Issue 7 was rated as most important reflecting participants' interest in assessing the roles of computers in school curriculum. Issues 1 and 2 both relate to courseware and were rated second and third most important, respectively. Participants are concerned with the quality of courseware that is developed, the evaluative criteria by which it should be measured, and the processes for efficiently and effectively developing and evaluating courseware. Issue 3 reflects participants' interest in determining the training teachers and administrators should/need to have to maximize computer use in classrooms. Finally, fifth most important Issue 14 inquires into research that should be conducted on the educational uses of computers.

Participants in this AIT study recognize that more information is needed in order to best address these issues. Although suggestions were forwarded on the questionnaires and in the small-group discussions, consortium members are clearly interested in sharing information, learning about , and discussing these policy issues.

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Part 3: Appendices

Appendix A: Questionnaire

Appendix B: Participating States and Provinces

Appendix C: Round 2 Means and Standard Deviations per Issue

APPENDIX A: Questionnaire

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**Delphi Study on Policy Issues
in the Introduction and Management
of Computers in the Classroom**

As a participant in this study, you represent not only yourself, but also your agency. Please read each item carefully and respond thoughtfully. It will take approximately 30 minutes to complete the questionnaire.

For each issue we suggest you read the main question and its fuller description; followed by a re-reading of the main question. Then use the evaluative criteria to rate the value of each issue to your agency. Please add comments to further clarify the issues or to elaborate on the rating you mark. Remember, it is not our intention that you attempt to answer the questions posed; rather we want to explore the value you place on having the question studied.

When you have completed evaluating the 21 issues in this packet, please answer the 2 questions below, put in your name and address, and mail the entire questionnaire to AIT by March 14.

Thank you.

The 3 issues of HIGHEST priority are: ___, ___, ___.
The 3 issues of LOWEST pirority are: ___, ___, ___.

Name _____

Agency _____

Address _____

_____

_____

Please mail by MARCH 14 to:

Saul Rockman
Agency for Instructional Television
Box A

How can educational agencies promote the development of high-quality, low-cost, effective courseware for use with computers?

Productive use of computers to support instruction is dependent upon the quality, cost and effectiveness of courseware. What organizations are capable of developing high quality courseware? Under what conditions should districts and teachers undertake courseware development activities? How should schools make their courseware needs known? What incentives are there for quality in courseware? How can districts locate and acquire good courseware? What are the benefits of courseware licensing agreements? Will conflicts arise with home and school use of similar instructional courseware?

- COMMENTS -

Evaluative Criteria

1. Large problem	1	2	3	4	5	Small Problem
2. Important for my agency's function	1	2	3	4	5	Not appropriate for this project to study
3. Impacts many	1	2	3	4	5	Impacts few
4. Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

How and by whom should computer courseware be evaluated?
How can the results be disseminated?

The proliferation of computer courseware is both a blessing and a dilemma. It provides many alternatives to the user but also makes the process of evaluation and selection greater than any one individual can manage. What standards of quality should be established and maintained? What agencies should be involved in the evaluation of courseware? What criteria are most useful for evaluating courseware? Should there be central courseware evaluation units and clearinghouses?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What computer training should be required for teachers and administrators?
How should the training differ?

Different training is often needed for the various administrative, management, and teacher-learning functions in educational organizations. Training may vary in length, scope, content, technical sophistication and the extent of hands-on experience.

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

How high a priority should be placed on funding to support computers in the schools?

Which funding agencies should bear the responsibility for hardware and courseware acquisition and distribution? Courseware development? Inservice and preservice? Administrative applications? Testing? What is the role of the federal government in funding?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What roles should business and industry play in the adoption and use of computer technology in schools?

This issue addresses the types and extent of support the private sector should be encouraged to offer. Support from business and industry can come in the forms of fundings, hardware, volunteers and personal exchanges, internships, etc. What are the limits of business and industry's influence on what is taught in schools?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's functior	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

61

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

60

What other groups are interested in the use of computers in the schools? What is their influence?

Groups such as PTA/PTO's, community and professional organizations have already become involved with computers in schools. What is the range and focus of outside concern? What influence are these groups having? In what activities should these groups become involved?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What roles will computers have in the school curriculum?

This issue includes the determination of goals for microcomputer usage and the extent of their integration. Computer literacy, CAI, programming and access to data bases are common applications. What are the best uses for computers in classroom curriculum? At what grade level should the computer be introduced? In which content areas can it meet curricular goals and student needs most effectively?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

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Is there a specific need for "computer literacy" curricula within the broader scope of K-12 curricular concerns?

As schools have focused increasing interest on the adoption of computer technology for teaching and learning, there has been increasing pressure to teach "computer literacy" to students. The point has been made that contemporary society generally knows how to use automobiles but it is not -- nor does it need to be -- "car literate." What does "computer literacy" mean? Is it necessary for students to become "computer literate" rather than competent users of computers? What computers? What computer competencies are important at each grade level?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

Should all students meet minimum computer competency requirements?

The question of standards in any curricular area is complex. It is no less so with "computer literacy." Once we know what the term means, we might ask if grade-level or graduation standards should be imposed. If so, should it be done at a national, state, local, or some other level? Should all local districts be required to comply with standards set at higher levels? Should "computer literacy" be treated as another basic skill? How and by whom should "computer literacy" performance be tested? In seeking definitions of the terms and answers to the question of standards, models of research and promising practices will be needed for guidance.

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What do teachers need to know about the use of computers in education?
Should certification requirements be established?

The growth of computer use in schools raises issues about the capacity of teachers to cope with and use computers wisely. If "computer literacy" standards were to be established for students, it follows that similar standards should apply to at least some teachers. Consequently, two categories of questions arise:

- comments -

1. Teacher requirements: Should "computer literacy" be a certification requirement? Should such a requirement be applied retroactively to presently-certified teachers? If certification requirements were established, should different standards apply to different categories of teachers?
2. Training and support: If a "computer literacy" certification were established, what kind of pre- and in-service training and support programs would be needed in order to reasonably meet the requirement?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

How does the introduction of computers into the classroom affect teachers and administrators personally and professionally?

What is the profile of teachers and administrators who use computers in classroom or office? How will the role of teachers change with increased use of computers? How can teachers be motivated to use computers in their classrooms? Will the new technologies create stress for teachers, students and others? If so, what can be done to reduce such stress?

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
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4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)

___ federal level
___ state/provincial level
___ regional level
___ local level
___ other level: please specify _____

6. Of greatest concern within: (Please circle one)

(1-3 years) (4-6 years) (7-10 years)

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How should resources be allocated to insure equal educational access to computers?

This issue goes beyond the disparity among rich and poor districts and schools. It includes limiting the availability of computers to only the gifted or remedial students. Can other organizations (e.g., public libraries) be helpful in solving the equity problem?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
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   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

Is the unauthorized duplication of educational courseware detrimental to production and distribution of courseware?

Developers and distributors have to charge higher per unit prices for their products because they need a reasonable return on their investment. In addition, there are ethical and moral implications of educators copying computer programs without permission.

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
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   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What kinds of research should be done concerning educational uses of computers?

There are instructional effects of using computers in schools. Included in this issue would be both positive and negative physical, cognitive, affective and sociological impacts of computer use. Which students benefit most from the instructional use of computers? Will research findings affect computer adoption and use?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
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   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

How can educational agencies encourage realistic and reasonable plans and expectations related to the use of computers?

The current "technology hype" created by media, commercial interests, and education itself, is developing expectations for unrealistic outcomes. Parents, community groups and some educators may be creating pressures that prevent reasoned planning, implementing and evaluating computer use. Should attention be focused on a more broadscale integration of technology in school curricula, rather than on only one medium?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
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   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

How should schools identify and use outside human resources to further the use of computer technology?

A wide variety of human resources exists both inside and outside schools which can be assessed and used. These include retrained teachers, advanced placement students, retired volunteers, college and university personnel, personnel from other systems, private sector resources, and community agencies. Educational institutions have been somewhat reluctant to identify and utilize these resources.

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ___ federal level
   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

How can the introduction of computers assist in cost-containment in the educational enterprise?

The cost of doing business in education continues to escalate. Is it possible to place some restraint on these increases through the use of technology, yet without tampering with the essential roles and responsibilities of the teacher? Is cost-containment more appropriately applied to the general curriculum, auxiliary programs, instructional services, or management services?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

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   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What kinds of strategies are most effective for educators in dealing with vendors?

At times, the collective strategy of groups of users may be more effective than individual efforts. In developing effective strategies, much can be gained from the experience of other users. Such experience might reveal useful standard contracts regarding purchase, maintenance, warranty, courseware transportability, and on-site training. Vendors might be persuaded to enter into state-wide annual bid agreements. Educators might consider the establishment of regional or statewide collectives as they set strategy for purchase.

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
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   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What standards (guidelines) should be established for hardware acquisition?

With the proliferation of mutually-incompatible low-cost computers, a potential user is faced with many difficult choices. Most claim that the rapid advancement of technology depends upon the competition generated by non-standardized machines. Educators counter that such incompatibility severely limits the potential use of the computers they buy. Would educators be aided by the establishment of standards (guidelines) for hardware acquisition? If so, what should the criteria be? Should hardware standards (guidelines) be related to courseware availability? to machine capacity? to price? How restrictive should these standards (guidelines) be?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

88

6. Of greatest concern within: (Please circle one)

87 (1-3 years) (4-6 years) (7-10 years)

What organizational plans have been successful in introducing and managing the use of computers in schools?

Each educational agency has an organizational structure. Are these structures conducive to the introducing of computers into schools? Which organizational strategies have been shown to be most successful? What management techniques are successful for utilizing computers in classrooms?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
4.	Appropriate for this project to study	1	2	3	4	5	Not appropriate for this project to study

5. Of greatest concern at: (check as many as necessary)
   - ____ federal level
   - ____ state/provincial level
   - ____ regional level
   - ____ local level
   - ____ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

What agencies should set standards (guidelines) for the acquisition, development and dissemination of courseware and hardware? Should they also set standards for teacher certification?

hat is the appropriate role for the federal agencies, state/provincial educational and elecommunications agencies, regional, and local agencies in the acquisition and development of omputer technology? Should some aspects of the responsibility rest entirely with intermediate units or districts? What roles and responsibilities should commercial nd/or independent non-commercial organizations (e.g., AIT, PTV stations) play in etting standards and distributing hardware and software? Are specific types of leadership needed at different levels? Who should enforce the standards?

- comments -

Evaluative Criteria

1.	Large problem	1	2	3	4	5	Small Problem
2.	Important for my agency's function	1	2	3	4	5	Not important for my agency's function
3.	Impacts many	1	2	3	4	5	Impacts few
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   - ___ state/provincial level
   - ___ regional level
   - ___ local level
   - ___ other level: please specify _____

6. Of greatest concern within: (Please circle one)
   (1-3 years) (4-6 years) (7-10 years)

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Please return to the first page and respond to the last two questions.

APPENDIX B: Participating States and Provinces

State	Rounds
Alabama	1 and 2
Alaska	2
Arkansas	1 and 2
California	1
Colorado	1 and 2
Connecticut	1 and 2
Florida	1 and 2
Hawaii	1 and 2
Illinois	1 and 2
Indiana	2
Iowa	1 and 2
Kentucky	1 and 2
Maine	1 and 2
Maryland	1 and 2
Massachusetts	1 and 2
Michigan	1 and 2
Minnesota	1 and 2
Missouri	1
Nebraska	1
New Jersey	1 and 2
New Mexico	1
New York	1 and 2
North Dakota	1
Ohio	1 and 2
Oregon	1 and 2
Pennsylvania	1 and 2
Rhode Island	1 and 2
Tennessee	1 and 2
Texas	1 and 2
Utah ---	1 and 2
Vermont	1
Virginia	1 and 2
Washington	1 and 2
West Virginia	1 and 2
Wisconsin	1 and 2
British Columbia	1 and 2
Alberta	1 and 2
Manitoba	1
Ontario	1 and 2

APPENDIX C: Round 2 Means and Standard Deviations per Issue

	Size		Importance		Impact		Appropriateness		Time	
Issue	$\bar{M}$	SD	$\bar{M}$	SD	$\bar{M}$	SD	$\bar{M}$	SD	$\bar{M}$	SD
1	1.49	.62	1.85	.85	1.38	.57	1.72	.80	1.04	.18
2	1.52	.59	1.97	.93	1.38	.52	2.04	1.03	1.07	.21
3	1.79	.74	1.88	.85	1.58	.66	2.59	1.05	1.07	.22
4	2.03	.82	2.24	.99	1.77	.68	2.96	1.08	1.05	.14
5	2.94	.70	3.01	.87	2.70	.71	3.37	.90	1.35	.43
6	3.38	.67	3.59	.82	3.22	.81	3.92	.76	1.40	.45
7	1.18	.44	1.29	.52	1.18	.44	1.33	.57	1.02	.17
8	2.00	.65	2.00	.84	1.64	.56	2.22	.84	1.15	.38
9	2.82	.77	2.95	.98	2.28	.91	3.22	1.03	1.57	.56
10	2.06	.87	2.33	1.06	1.81	.73	3.02	1.01	1.45	.47
11	2.16	.73	2.53	.98	2.08	.86	2.78	.98	1.36	.48
12	2.12	1.00	2.53	1.16	2.12	.98	3.00	1.05	1.33	.44
13	2.53	.97	3.11	1.10	2.77	1.08	3.49	1.18	1.39	.48
14	1.84	.77	2.18	.82	1.77	.82	2.07	1.06	1.45	.52
15	1.89	.63	1.89	.77	1.76	.68	2.23	.88	1.16	.32
16	3.24	.73	3.36	.85	3.17	.84	3.86	.77	1.67	.50
17	2.63	.71	2.93	.95	2.61	.77	3.42	1.10	1.57	.53
18	3.02	.89	2.93	1.01	2.51	.92	3.61	1.03	1.16	.37
19	2.27	.93	2.38	1.00	1.95	.95	2.71	1.13	1.10	.27
20	2.27	.91	2.28	.88	2.16	.94	2.52	.98	1.06	.22
21	2.54	.75	2.50	.99	2.22	.82	3.09	1.02	1.35	.44

END